Eviota hoesei and E. readerae, New Species of Fish from the Southwest Pacific, With Comments on the Identity of E. corneliae Fricke (Perciformes: Gobiidae)

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ABSTRACT. Eviota hoesei n.sp. is described from specimens from New Caledonia, Lord Howe Island (type locality), Norfolk Island, and Middleton and Elizabeth Reefs. It is distinguished from congeners in having the following character combination: dorsal-fin rays usually VI + I,9; anal-fin rays usually I,8; at least some pectoral-fin rays branched; cephalic sensory-pore system pattern 2; base of pectoral fin with two diffuse to prominent dark spots; fifth segmented pelvic-fin ray present, usually about 1/10 length of fourth ray; and 6 subcutaneous bars/spots on lower postanal trunk. Eviota readerae n.sp. is described from specimens from Middleton (type locality) and Elizabeth Reefs. It is distinguished from congeners in having the following combination of characters: dorsal-fin rays VI + I,9; anal-fin rays I,8; at least some pectoral-fin rays branched; fifth segmented pelvic-fin ray lacking; cephalic sensory-pore system pattern 1; male genital papilla non-fimbriate; 12–13 dark bars or saddles on trunk from origin of spinous dorsal fin to mid peduncular spot, not extending below midline; and pectoral-fin base with prominent circular dark spot dorsally. Eviota corneliae Fricke is placed in synonymy with Trimmatom eviotops (Schultz).

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Eviota Jenkins (1903) is a genus of small, reef-associated gobiids found throughout the Indo-Pacific. It is distinguished from other gobiid genera by the following combination of characters (Lachner & Karnella, 1980): small adult size (females usually sexually mature at less than 15 mm SL); pelvic fins separate, a fine fragile

membrane joining bases, fraenum absent; pelvic-fin rays I,4 or I,5, the fifth segmented ray (when present) a simple rudiment or an unbranched ray; fourth segmented pelvic-fin ray multi-branched; trunk usually with dark subcutaneous spots or bars; first dorsal fin with 6 spines; scales ctenoid, fewer than 30 in lateral series, absent from head,

nape and base of pectoral fin; and gill opening narrow.

The second author (formerly Susan J. Karnella) published four papers on the systematics of *Eviota* with the late Ernest A. Lachner (Lachner & Karnella, 1978, 1980; Karnella & Lachner, 1981; Jewett & Lachner, 1983). In those papers they recognized 41 valid species, but noted that additional undescribed species were known. They had planned to describe those species, but those plans were never realized. We herein describe two new species, both of which occur within Australian waters and have been listed in faunal checklists. Only six other Eviota species have been described since 1983: E. corneliae Fricke (1998) (but see below), E. lacrymae Sunobe (1988), E. mikiae Allen (2001), E. raja Allen (2001), E. rubra Greenfield & Randall (1999), and E. susanae Greenfield & Randall (1999). Our examination of E. corneliae reveals that it is not a species of Eviota. We therefore discuss the identity of this nominal species. We regard the other five as valid species of *Eviota*.

Materials and methods

We follow Lachner & Karnella (1980) for methods of making counts and measurements and for describing fin morphology and laterosensory pore/neuromast patterns. We use the term "segmented" for the fifth non-spinous ray in the pelvic fin in *Eviota* species, although it usually lacks segmentation when very short. Numbers in parentheses indicate numbers of individuals with a given count; underlined frequencies indicate holotype values. Although all type specimens of *E. hoesei* were checked for diagnostic characters, data for all specimens were not necessarily recorded; therefore frequencies given in the description are based on the holotype and a subset of paratypes. Institutional abbreviations follow Leviton *et al.* (1985).

Eviota hoesei n.sp.

Figs. 1, 2

Eviota sp. cf. afelei.—Allen et al., 1976: 430 (Lord Howe Island).Eviota n.sp. C.—Gill & Reader, 1992: 222 (Elizabeth and Middleton Reefs).

Type material. HOLOTYPE: AMS I.17367-004, 19.7 mm SL, Lord Howe Island, south lagoon reef crest, 31°32'S 159°04'E, 2-3 m, derris dust, D.F. Hoese, February 1973. PARATYPES: AMNH 211351, 5: 12.2–18.3 mm SL, collected with holotype; AMS I.17367-019, 63: 11.7-18.9 mm SL, collected with holotype; AMS I.20271-027, 3: 14.4-15.2 mm SL, Norfolk Island, Bumbora Beach, 29°04'S 167°56'E, tidepools containing algae, rock, sand and small amount of coral, rotenone, D.F. Hoese & H.K. Larson, 22 September 1975; AMS I.27137-011, 6: 12.9–13.9 mm SL, Middleton Reef, 29°27.5'S 159°04.2'E, lagoon patch reef, 2.5 m, rotenone, A.C. Gill et al., 5 December 1987; AMS I.27156-043, 2: 15.0-19.5 mm SL, Elizabeth Reef, 29°56.5'S 159°01.87'E, lagoon patch reef, 2–2.5 m, rotenone, A.C. Gill et al., 14 December 1987; ANSP 178731, 5: 12.8–17.9 mm SL, collected with holotype; BMNH 2003.1.22.2-6, 5: 14.6–18.1 mm SL, collected with holotype; BPBM 14951, 2: 15.6–16.5 mm SL, Lord Howe Island, southern lagoon, south of Salmon Beach, coral and sand, 2 m, rotenone, D.F. Hoese, 9 February 1973; BPBM 17572, 6: 9.5-16.8 mm SL, Lord Howe Island, southeast end of Middle Beach, rocky shore, 0-3 m, rotenone, D.F. Hoese et al., 11-15 February 1973; CAS 217049, 5: 12.4-19.1 mm SL, collected with holotype; USNM 228319, 20.5 mm SL. Lord Howe Island, Sylph Hole, 2–4 m, Australian Museum party, 5 February 1973; USNM 228320, 3: 8.5-18.7 mm SL, Lord Howe Island, King's Beach, 31°32'S 159°04'E, 2 m, quinaldine, D.F. Hoese, 6 February 1973; USNM 228321, 11: 12.0-18.9 mm SL, Lord Howe Island, south side of north passage, 31°32'S 159°04'E, lagoon reef, 2 m, derris dust, D.F. Hoese & G.R. Allen, 17 February 1973; USNM 228322, 14.0 mm SL, Lord Howe Island, south part of lagoon, 31°32'S 159°04'E, rock and algae, 3-6 m, derris dust, D.F. Hoese et al., 7 February 1973; USNM 228323, 1: 17.9 mm SL, collected with USNM 228321; USNM 324929, 3: 11.3-15.9 mm SL, New Caledonia, Noumea, Pointe Cluxel, 22°18'30"S 166°27'24"E, shallow patch reef with rubble at base, 0.5–2 m, J.T. Williams & G. Mou Tham, 7 November 1991.

Diagnosis. The following combination of characters distinguishes *E. hoesei* from congeners: dorsal-fin rays usually VI + I,9; anal-fin rays usually I,8; at least some pectoral-fin rays branched; cephalic sensory-pore system pattern 2; base of pectoral fin with two diffuse to prominent dark spots; fifth segmented pelvic-fin ray present, usually about 1/10 length of fourth ray; and 6 subcutaneous bars/spots on lower postanal trunk.

Description. Dorsal-fin rays VI + I,8(4), VI + I,9($\underline{42}$); analfin rays I,7(4), I,8($\underline{43}$); pectoral-fin rays 16(17), 17($\underline{30}$); pectoral-fin rays 8 through 17 may be branched, 11 through 15 always branched; pelvic-fin rays I,4 plus rudiment (7), I,4 1/10($\underline{40}$); branches on fourth segmented pelvic-fin ray 7–15, averaging 10.6; segments between consecutive branches of fourth segmented pelvic-fin ray 0–3, averaging 1.2; pelvic-fin membrane reduced; branched caudal-fin rays 12($\underline{4}$), 13(5), 14(9); segmented caudal-fin rays 17($\underline{43}$); lateral scale rows 23(1), 24($\underline{16}$), 25(23), 26(2); transverse scale rows 6($\underline{30}$), 7(9); breast scaleless; vertebrae 10($\underline{13}$) precaudal plus 16($\underline{13}$) caudal, total 26.

First two dorsal-fin spines in males may be filamentous, first longest, maximum extension to just behind end of second dorsal-fin base; females without filamentous spines. Pelvic fin usually reaches to anal fin, maximum length to about middle of anal-fin base. Cephalic sensory-pore system pattern 2; superficial neuromast (cutaneous papillae) system pattern B. Male genital papilla non-fimbriate.

Preserved coloration. Head dorsally either pale or with scattered brown speckles; head laterally with scattered brown speckles, sometimes with clusters of brown chromatophores; lips thinly margined with chromatophores; pectoral-fin base with two diffuse or distinct dark spots, occasionally with spots merging to form single spot, often with additional dusky pigmentation above and below spots (which forms additional spot in occasional specimens); dorsal trunk midline unpigmented; trunk with dark crescentshaped marks at scale pockets, usually darker ventrally; belly with 2–3 broad indistinct subcutaneous dusky patches; 6 subcutaneous bars/spots on lower postanal trunk, although last one or two bars may be indistinct in small specimens; subcutaneous bars on upper postanal trunk obscure, although 5 indistinct dusky bars may be present near midside, last through caudal spot; large round to oval or

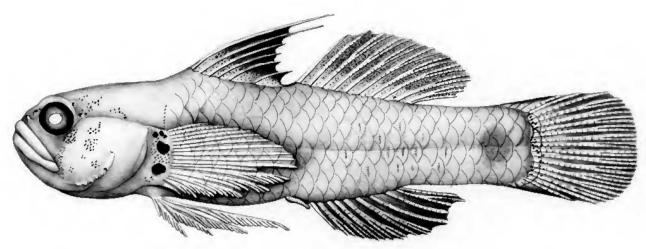


Fig. 1. Eviota hoesei, AMS I.17367-004, 19.7 mm SL, male, holotype, Lord Howe Island. (Drawn by J.R. Schroeder.)

rectangular dark spot on mid-caudal peduncle, all or mostly subcutaneous; first dorsal fin uniformly moderate to dark dusky, sometimes abruptly paler on base; second dorsal fin light to moderate dusky; anal fin similar to first dorsal, sometimes darker; caudal fin light to dark dusky or pale, with or without alternating dark and light spots on rays, usually paler basally; pectoral and pelvic fins pale.

Live coloration. Not recorded in detail. Allen *et al*. (1976) noted, however, that *E. hoesei* specimens collected from shallow water were green, whereas those from deeper water (below about 18 m) were red.

Etymology. The specific epithet is for our friend and colleague Douglass F. Hoese, in recognition of his important contributions to the systematics of gobioid fishes.

Comparisons. Eviota hoesei is a member of Lachner & Karnella's (1980) Group II species-group, which is diagnosed by the following: cephalic sensory-pore system pattern 2 (NA, AITO, PITO, SOT, AOT and POP pores present, IT pore absent); vertebrae usually 26; some pectoral-fin rays branched; pelvic-fin membranes joining first four segmented rays reduced; and fifth segmented pelvic-fin ray absent or very short. Eleven other species were assigned to Group II by Lachner & Karnella (Lachner & Karnella, 1980; Jewett & Lachner, 1983): E. afelei Jordan & Seale (1906), E. bimaculata Lachner & Karnella (1980), E. indica Lachner & Karnella (1980), E. japonica Jewett &

Lachner (1983), E. latifasciata Jewett & Lachner (1983), E. prasina (Klunzinger, 1871), P. punctulata Jewett & Lachner (1983), E. queenslandica Whitley (1932), E. saipanensis Fowler (1945), E. variola Lachner & Karnella (1980), and E. zonura Jordan & Seale (1906). Eviota hoesei differs from these species in the following: fifth segmented pelvic-fin ray usually 1/10 length of fourth segmented ray (usually rudimentary or absent in E. latifasciata, E. prasina, E. saipanensis, E. variola and E. zonura); second dorsalfin rays modally I,9 (modally I,8 in E. indica and E. latifasciata, and modally I,10 in E. variola); anal-fin rays modally I,8 (modally I,9 in E. variola); pectoral-fin rays usually 17 (with strong modes of 15 in E. indica, and 16 in E. japonica, E. punctulata and E. zonura); first two dorsalfin spines filamentous in males (none filamentous in E. indica and E. latifasciata; first spine rarely filamentous in E. punctulata); male genital papilla non-fimbriate (fimbriate in E. prasina, E. variola and E. zonura, and cup-shaped in E. saipanensis); two diffuse to prominent dark spots on the pectoral-fin base (two prominent spots otherwise present only in E. japonica and E. queenslandica, although weak spots may be present in E. prasina, E. variola and E. zonura); no prominent dark spots on the occipital region (dark spots present in E. bimaculata, E. japonica, E. prasina, E. punctulata, E. queenslandica and E. variola); first dorsal fin either uniformly dusky, or dusky with pale base (mostly pale in E. indica and E. latifasciata; at least first spine usually with dark spots in E. punctulata, E. queenslandica,

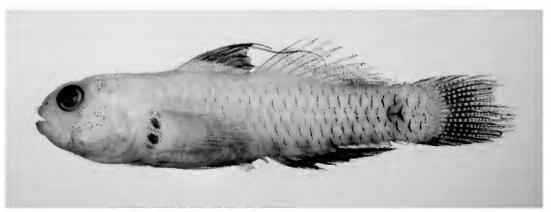


Fig. 2. Eviota hoesei, USNM 228323, 17.9 mm SL, male, paratype, Lord Howe Island. (Photographed by S.L. Jewett.)

E. bimaculata and E. variola); subcutaneous bars on upper posterior trunk obscure (4 in E. latifasciata, E. queenslandica, E. saipanensis and E. zonura, 4–5 in E. prasina, 5 in E. bimaculata, E. indica, E. japonica and E. variola, and 7–9 in E. afelei); subcutaneous bars/spots on lower posterior trunk 6 (4 in E. saipanensis and E. latifasciata, and 5 in E. prasina, E. queenslandica, E. variola and E. zonura); and dark spots along dorsal mid-line absent (well developed in E. japonica, E. prasina, E. queenslandica and E. variola).

Remarks. Eviota hoesei is known only from New Caledonia, the Norfolk Ridge (Norfolk Island) and Lord Howe Rise (Lord Howe Island and Middleton and Elizabeth Reefs). It has been collected from tidepools and rock and coral reefs in lagoons and reef slopes at depths ranging from 0.5 to 25 m. Gill & Reader (1992) noted that it was very common in the lagoon at Middleton and Elizabeth Reefs, and common on the reef slope at Elizabeth Reef. They further noted that it was the most abundant gobiid species at the reefs. Eviota prasina was also recorded as abundant at Elizabeth and Middleton Reefs and at Lord Howe Island (recorded by Allen et al., 1976, as E. viridis Waite, 1904, a junior synonym), but was found among coral rubble in reefcrest areas.

Eviota readerae n.sp.

Figs. 3, 4

Eviota n.sp. B.—Gill & Reader, 1992: 222 (Elizabeth and Middleton Reefs).

Type material. HOLOTYPE: AMS I.27141-018, 17.9 mm SL, Middleton Reef, tidal pools on exposed reef flat near wreck of *Fuku Maru*, 29°28.8'S 159°07.5'E, rotenone, A.C. Gill & S.E. Reader, 7 December 1987. PARATYPES: AMS I.27134-038, 3: 7.8-15.3 mm SL, Middleton Reef, 29°27.2'S 159°06.8'E, north face of outer reef slope, coral bommie, 6-9 m, rotenone, A.C. Gill et al., 4 December 1987; AMS I.27138-056, 3: 14.4-15.9 mm SL, Middleton Reef, mid back lagoon, 29°27.8'S 159°05'E, patch reef, 4-9 m, rotenone, A.C. Gill et al., 5 December 1987; AMS I.27148-031, 4: 9.6–17.5 mm SL, Elizabeth Reef, outer east slope, 29°57.2'S 159°01.2'E, 10 m, rotenone, A.C. Gill et al., 10 December 1987; AMS I.27149-034, 1: 14.5 mm SL, Elizabeth Reef, northeast outer slope, 29°54.8'S 159°02.8'E, 8–10 m, rotenone, A.C. Gill et al., 10 December 1987; AMS I.27149-040, 3: 9.5-15.9 mm SL, collected with AMS I.27149-034; AMS I.27296-001, 1: 10.5 mm SL, Middleton Reef, outer reef edge near wreck of Runic, 29°27.4'S 159°03.7'E, 30–40 m, airlift substrate sampler, J.K. Lowry & R.T. Springthorpe, 5 December 1987; BMNH 2003.1.22.7–8, 2: 9.9–14.9 mm SL, collected with AMS I.27134-038; USNM 372388, 2: 14.0–14.6 mm SL, collected with AMS I.27134-038.

Diagnosis. The following combination of characters distinguishes *Eviota readerae* from congeners: dorsal-fin rays VI + I,9; anal-fin rays I,8; at least some pectoral-fin rays branched; fifth segmented pelvic-fin ray lacking; cephalic sensory-pore system pattern 1; male genital papilla non-fimbriate; 12–13 dark bars or saddles on trunk from origin of spinous dorsal fin to mid peduncular spot, not extending below midline (except in small juveniles); and pectoral-fin base with prominent circular dark spot dorsally (only occasionally with additional small diffuse spot ventrally).

Description. Dorsal-fin rays VI + I,9($\underline{20}$); anal-fin rays I,8($\underline{20}$); pectoral-fin rays 16(1), 17($\underline{16}$), 18(3); pectoral-fin rays 9 through 17 may be branched, 11 through 15 always branched; pelvic-fin rays I,4 ($\underline{20}$); branches on fourth segmented pelvic-fin ray 7–12, averaging 8.9; segments between consecutive branches of fourth segmented pelvic-fin ray 0–3, averaging 1.1; pelvic-fin membrane reduced; branched caudal-fin rays 13($\underline{6}$), 14(4), 15(1); segmented caudal-fin rays 17($\underline{20}$); lateral scale rows 23(1), 24(2), 25(5), 26($\underline{3}$); transverse scale rows 6(4), 7($\underline{8}$); breast scaleless; vertebrae 10($\underline{16}$) precaudal plus 16($\underline{16}$) caudal, total 26.

Spinous dorsal fin not elongate in either sex. Pelvic fin usually reaches to anus, maximum length to about base of second segmented anal-fin ray. Cephalic sensory-pore system pattern 1; superficial neuromast (cutaneous papillae) system pattern A. Male genital papilla non-fimbriate.

Preserved coloration. Four weak saddles to dark bars present dorsally on head and on nape in front of spinous dorsal fin; anteriormost two bars ending ventrally in prominent dark spots; head otherwise generally pale or with clusters of brown chromatophores, usually around posterior margin of eye, on lower cheek, just behind mid-posterior edge of eye, on anterior part of opercle, on subopercle, on branchiostegal membrane (adjacent to subopercle cluster), and sometimes on chin and lower lip; pectoral-fin base with prominent circular dark spot dorsally, which may encroach posteriorly on to bases of upper few pectoral-fin rays; small diffuse second spot or cluster of melanophores occasionally on ventral part of pectoral-fin base; 12–13 prominent dark bars present on trunk from origin of spinous dorsal fin to midpeduncular spot; bars generally not extending below midline, often reduced to series of short dorsal saddles, extending below midline only in small juveniles; five subcutaneous spots or short bars on lower postanal trunk, though some or all may be weakly developed or lacking in some specimens; last subcutaneous bar continuous with



Fig. 3. Eviota readerae, AMS I.27141-018, 17.9 mm SL, female, holotype, Middleton Reef. (Photographed by H. Taylor.)



Fig. 4. Eviota readerae, AMS I.27148-031, 17.4 mm SL, male, paratype, Elizabeth Reef. (Photographed by H. Taylor.)

prominent caudal peduncle spot, which is all or mostly subcutaneous; scale margins may be lightly edged with melanophores, but scale pockets not outlined; trunk bars and subcutaneous spots sometimes extending slightly on to dorsal and anal fins; spinous dorsal fin immaculate pale, or pale with 1–2 broad, diffuse dusky bars; second-dorsal and anal fins varying from pale to dusky; caudal, pectoral and pelvic fins may have rays bordered with melanophores, but otherwise pale.

Live coloration. Not recorded.

Etymology. The specific epithet is for Sally E. Reader, who assisted the first author with the collection of most of the type specimens, and kindly arranged the loan of specimens for this study.

Comparisons. Eviota readerae is a member of Lachner & Karnella's (1980) Group I species-group, which is diagnosed by the following: total vertebrae usually 26; some pectoral-fin rays branched; male genital papilla nonfimbriate; and cephalic sensory-pore system 1 (NA, AITO, PITO, SOT, AOT, POP and IT pores present). It belongs to a complex of species within this group that Karnella & Lachner (1981) termed the Eviota epiphanes complex. Eviota readerae and the other members of this complex (E. disrupta Karnella & Lachner, 1981, E. epiphanes Jenkins, 1903, E. fasciola Karnella & Lachner, 1981, and E. irrasa Karnella & Lachner, 1981) differ from other Group I species in sharing the following combination of characters: dorsalfin rays usually VI + I,9; anal-fin rays usually I,8; no elongation of spinous dorsal-fin rays in either sex; pelvicfin rays I,4; pelvic-fin membranes joining segmented rays reduced; segments between consecutive branches of fourth pelvic-fin ray usually 1; and five subcutaneous spots on lower postanal trunk. The species are also similar in general coloration: head and nape with bars dorsally; at least short bars or saddles along the dorsal midline of the trunk; head

with scattered large chromatophores ventrally and laterally, often arranged in clusters or large spots; caudal peduncle with well-developed subcutaneous spot, which is integrated with a weak to strong subcutaneous bar; and first dorsal fin with dark irregularly mottled or barred pattern. The five species are differentiated on the basis of coloration characters (see Karnella & Lachner, 1981: table 1). The following characters distinguish *E. readerae*: pectoral-fin base with prominent circular dark spot dorsally (versus weak spot dorsally in *E. epiphanes*, well-

developed kidney-shaped or semicircular mark over entire base in E. fasciola, a dorsal and a ventral well-developed discrete circular spot in E. disrupta, and a dorsal and a ventral well-developed indiscrete oval or circular spot in E. irrasa); pectoral spot equal to or darker than other body pigmentation (versus equal to or less than in E. epiphanes, equal to in E. irrasa, and darker than in E. fasciola and E. disrupta); trunk bars not extending below midline (reduced to saddles in E. epiphanes, and extending to lower body in E. fasciola and E. disrupta); trunk bars usually discrete and uniform (versus interrupted anteriorly in E. disrupta, and not discrete in E. irrasa); branchiostegal mark present (versus absent in E. epiphanes); no scale pocket pigmentation (versus weakly developed in E. irrasa, and well developed in E. epiphanes); and pale area present on posterior opercle and anterior pectoral-fin base (absent in E. epiphanes).

Remarks. *Eviota readerae* is known only from Middleton and Elizabeth Reefs on the Lord Howe Rise, Tasman Sea. It has been collected from tidal pools, lagoon patch reefs and reef slopes at depths ranging from about 0.3 to at least 30 m.

Identity of Eviota corneliae Fricke, 1998

Fricke (1998) described *E. corneliae* on the basis of two specimens from Maré Island, Loyalty Islands. He assigned the species to the *E. epiphanes* complex on the basis of it having vertical trunk bars. Several salient details are missing from Fricke's description, particularly details of head pore structure. We therefore borrowed the holotype (SMNS 19870) in order to make comparisons with *E. readerae* and other *E. epiphanes* complex species. Our examination of the holotype revealed that it is not a species of *Eviota*, differing in various details: head pores absent (versus usually present in *Eviota*; absent only in one undescribed species); subcutaneous spots or bars absent (versus almost always present); and gill opening wide (versus narrow), extending



Fig. 5. *Trimmatom eviotops*, SMNS 19870, 14.0 mm SL, holotype of *Eviota corneliae* Fricke, Maré Island, Loyalty Islands. (Photographed by H. Taylor.)

to vertical through rear edge of eye. We also noticed several discrepancies with the original description: there are I,5 not I.4 pelvic-fin rays (the inner ray is small and unbranched): whereas Fricke recorded the lower seven pectoral-fin rays as branched, we could find no evidence of branched rays in the fin (although the ray tips of most rays are broken, some of the lower rays are undamaged and not branched); Fricke recorded a spine and eight rays in the anal fin, but there are 10 rays, the anteriormost of which is bilaterally paired, thus not a true spine; and the positions of some of the trunk bars are incorrectly depicted (compare Fricke's fig. 1 with Fig. 5). Also, although Fricke correctly gave the length of the holotype as 14.0 mm SL, the scale bar in his figure suggests that the specimen is about 35 mm SL; the scale bar is obviously intended to indicate 2 mm, not 5 mm as incorrectly indicated in the figure caption.

The *E. corneliae* holotype keys to *Trimmatom* Winterbottom & Emery (1981) using Larson & Murdy's (2001) key to western central Pacific gobiid genera. We therefore contacted R. Winterbottom, current expert on *Trimmatom* and related genera, for assistance. He confirmed the generic assignment, although noting that the recognition of the genus as distinct from *Trimma* Jordan & Seale is tentative; his phylogenetic studies suggest that *Trimmatom* is nested within *Trimma*, and that the recognition of *Trimmatom* may therefore render *Trimma* paraphyletic (see also Winterbottom, 1990). He further identified the holotype as *Trimmatom eviotops* (Schultz, 1943). *Eviota corneliae* Fricke (1998) is therefore a junior subjective synonym of *Trimma eviotops* Schultz (1943).

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